

We claim:

1. A semiconductor nanocrystal complex comprising:
  - a surface-coated semiconductor nanocrystal comprising a semiconductor nanocrystal having a surface coating the semiconductor nanocrystal; and
  - a diblock polymer coating surrounding the surface-coated semiconductor nanocrystal, the diblock polymer coating comprising a plurality of diblock polymers, each of the plurality of diblock polymers having a hydrophobic end for noncovalently interacting with the surface-coated semiconductor nanocrystal and a hydrophilic end, wherein adjacent ones of the plurality of diblock polymers are linked together by a bridging molecule.
2. The semiconductor nanocrystal complex of claim 1, wherein the hydrophobic end comprises 80 to 160 carbon atoms.
3. The semiconductor nanocrystal complex of claim 1, wherein the bridging molecule comprises two or more amine groups
4. The semiconductor nanocrystal complex of claim 1, wherein the bridging molecule comprises a diamine.
5. The semiconductor nanocrystal complex of claim 1, wherein the bridging molecule is bis 2,2'-(ethylenedioxy) bis (ethylamine).
6. The semiconductor nanocrystal complex of claim 1, wherein the surface is selected from the group consisting of trioctyl phosphine oxide, trioctyl phosphine, tributyl phosphine, dodecyl amine, octadecyl amine, hexadecylamine, stearic acid, oleic acid, palmitic acid, and lauric acid.

7. The semiconductor nanocrystal complex of claim 1, wherein the diblock polymer is selected from the group consisting of poly(acrylic acid-b-methyl methacrylate), poly(methyl methacrylate-b-sodium acrylate), poly(t-butyl methacrylate-b-ethylene oxide), poly(methyl methacrylate-b-sodium methacrylate), poly (methyl methacrylate-b—N-methyl 1-4vinyl pyridinium iodide), poly(methyl methacrylate-b-N,N-dimethyl acrylamide), poly(butadiene-b-methacrylate acid and sodium salt), poly(butadiene(1,2 addition)-b-acrylic acid), poly(butadiene(1,2 addition)-b-sodium acrylate), poly(butadiene(1,4 addition)-b-acrylic acid), poly(butadiene(1,4 addition)-b-sodium acrylate), poly(butadiene(1,4 addition)-b-ethylene oxide), poly(butadiene(1,2 addition)-b-ethylene oxide), poly(styrene-b-acrylic acid), poly(styrene-b-acrylamide), poly(styrene-b-caesium acrylate), poly(styrene-b-sodium acrylate), poly(styrene-b-ethylene oxide), poly(styrene-b-methacrylic acid), and poly(styrene-b-sodium methacrylate).

8. The semiconductor nanocrystal complex of claim 7, wherein the diblock polymer is poly(butadiene (1,4 addition)-b-acrylic acid).

9. The semiconductor nanocrystal complex of claim 7, wherein the diblock polymer is poly(styrene-b-acrylic acid).

10. The semiconductor nanocrystal complex of claim 1, wherein the hydrophilic end comprises functional groups for coupling to one or more tertiary molecule.

11. The semiconductor nanocrystal complex of claim 10, wherein the functional groups are amine groups.

12. The semiconductor nanocrystal complex of claim 10, wherein the tertiary molecule is a biomolecule.

13. The semiconductor nanocrystal complex of claim 12, wherein the tertiary molecule is a member of a specific binding pair.
14. The semiconductor nanocrystal complex of claim 13, wherein the member of the specific binding pair is selected from the group consisting of antibody, antigen, hapten, antihapten, biotin, avidin, streptavidin, IgG, protein A, protein G, drug receptor, drug, toxin receptor, toxin, carbohydrate, lectin, peptide receptor, peptide, protein receptor, protein, carbohydrate receptor, carbohydrate, polynucleotide binding protein, polynucleotide, DNA, RNA, aDNA, aRNA, enzyme, substrate.
15. The semiconductor nanocrystal complex of claim 10, wherein the functional groups are selected from the group consisting of hydroxys, amines, carboxyls, sulfonates, phosphates, and nitrates.
16. The semiconductor nanocrystal complex of claim 10, wherein the tertiary molecule is selected from the group consisting of an polypeptide, glycopeptide, peptide nucleic acid, oligonucleotide, aptamer, cellular receptor molecule, enzyme cofactor, oligosaccharide, a liposaccharide, a glycolipid, a polymer, a metallic surface, a metallic particle, and a organic dye molecule.
17. A method of manufacturing a semiconductor nanocrystal complex having an amine-terminated functional group, the method comprising:
- providing a semiconductor nanocrystal;
  - exposing the semiconductor nanocrystal to a diblock polymer, wherein the diblock polymer has a hydrophobic end and a hydrophilic end, the hydrophilic end comprising carboxy terminal functional groups;
  - exposing the semiconductor nanocrystal to a multidentate molecule having more than one amine functional group;
  - forming a semiconductor nanocrystal complex having an amine-terminated functional group.

18. The method of claim 13, wherein the multidentate molecule is Bis (2,2'-(ethylenedioxy)bis(ethylamine)).